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AUTHOR Ripstra, Constance C.; And Others
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ABSTRACT

A partial replication of an investigation of the effect of covert reinforcement on a perceptual estimation task is described. The study was extended to include an extinction phase. There were five treatment groups: covert reinforcement, neutral scene reinforcement, noncontingent covert reinforcement, and two control groups. Each subject estimated a set of projected circles and was cued accordingly by the experimenter for either over- or underestimation. During the extinction phase, the subject administered the cuing and reinforcement. Results partially substantiated the previous findings in that the three reinforcement groups performed significantly better than did the two control groups. (Author)

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COVERT REINFORCEMENT: A PARTIAL REPLICATION

By

Constance C. Ripstra

and

S. E. Elson
R. G. Johnson
V. G. Schmickley
L. Rate
G. Yager

Behavioral Counseling Laboratory
College of Education
Michigan State University

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INTRODUCTION

Cautela (1970) introduced a new clinical procedure to modify behavior. Based on operant conditioning principles, the procedure provided a means to insure that adaptive target behaviors were followed by reinforcing stimili. Interestingly, both the target behavior and the reinforcing stimulus are presented in the imagination of the client. The role of the therapist is simply to direct the client's imagination toward successive approximations of the target behavior and to manage the reinforcement contingency by insuring through instructions to the client that the symbolic consequence of the imaginal target behavior is a reinforcer.

The advantages of using imagery in the modification of behavior have been articulated by Cautela (1970). Most significant are the facts that imagery is not limited by practical reality and that imagery can be used as a self-control procedure by the client.

Covert reinforcement (COR) in combination with other covert procedures has been employed by clinicians to treat obsessive-compulsive behavior (Wisocki, 1970), overeating (Cautela, 1972), homosexuality (Kendrick & McCullough, 1972), phobias (Blanchard & Draper, 1973), self-injurious behavior (Cautela & Baron, 1973), and heroin addiction (Wisocki, 1973). Although the procedure seems very promising, the anecdotal literature fails to control for the therapeutic effects of other procedures, the expectancies of the clients, and the reinforcing power of individual therapists.

Several comparative group studies have sought to establish the efficacy of covert reinforcement. Kropp, Calhoon, and Verrier (1971) found that COR was more effective in changing children's self-evaluative responses than overt reinforcement. Cautela and Wisocki (1969) and Cautela, Walsh and Wish (1971) found that COR was superior to a no-reinforcement control group in modifying the evaluative responses of college students toward the aged and

toward mental retardates respectively. Flannery (1972) used COR to increase the approach behaviors to rodents of fearful college students. Other students, having similar fears, who participated in a discussion or received no treatment at all did not change their advances to the rat. On the basis of these studies covert reinforcement appears to be a judicious procedure particularly suited to increasing approach and cognitive target behaviors.

The two basic assumptions upon which covert reinforcement is based are: 1) that overt learning principles apply to covert processes, specifically that a reinforcer presented in imagination does, in fact, increase the response probability of the occurrence of its imaginal antecedent and 2) that covert processes can modify overt behavior. Two laboratory studies treating covert reinforcement as an independent variable have specifically attempted to validate the second assumption (although in a sense the two assumptions are inextricably bound together). Epstein and Peterson (1973) demonstrated that imaginal reinforcing scenes and imaginal punishing scenes differentially affected the rate of the emission of two different sets of numbers upon which they were respectively contingent. In an earlier study, Wish, Cautela and Steffen (1970) were able to predictably influence the size estimations of circles by instructing subjects to covertly reinforce themselves for either under- or over-estimations. The covert reinforcement group was significantly superior to four control groups.

Although these studies, along with one other laboratory investigation of covert negative reinforcement (Ascher & Cautela, 1972), lend support to the assumptions underlying the COR procedures, Mahoney (1972) has noted that the most pressing research task in covert behavior modification is controlled replication and expansion. The purpose of the present study is to partially replicate and extend the Wish, Cautela, and Steffen (1970) study.

"Partial" means that task stimuli, training procedures and statistical analyses differ slightly and that a self-reinforcement phase is added.

METHODS

Subjects

40 volunteer college psychology students were randomly assigned to one of the ten treatment conditions.

Design

The design was identical to that used in the Wish, Cautela and Steffen study. Two independent variables were investigated in a 5 x 2 cell design, with the treatment variable having five levels: 1) covert contingent reinforcement with a highly positive scene (COR); 2) contingent covert reinforcement with a neutral scene; 3) noncontingent covert reinforcement with a highly positive scene; 4) the word "reinforcement" only following a correct response; 5) no feedback group. The second variable was for reinforcement of either over- or under- estimation of the projected circles.

Task

The task involved verbal estimation of the diameter of a set of six circles which ranged from one to three inches at half inch increments. The circles, white on a black background, were presented by means of a slide projector. A circle slide and a black slide were alternated at eight second intervals.

The first set of 18 estimations with each circle being presented three times, was used to generate a mean estimation for each circle size. For the following set of 36 estimations, each circle being presented six times, each estimation was compared to that circle's mean to determine whether a reinforcer was appropriate. For the non-contingent group the word "Reinforcement" was not contingent on the subject's response but rather was yoked to the reinforcements received by the preceding COR subject. With the exception of the

no feedback group, if the estimation were in the appropriate direction, depending on the group to which the subject was assigned, the experimenter would say the word "Reinforcement." For the COR, Neutral scene and Non-contingent groups this indicated that the subject should imagine the practiced scene. The subject was allowed eight seconds to clearly imagine the scene. For the extinction phase of 18 circles the subject was instructed to verbally indicate whether he thought his response was appropriate, and if so, to follow the previous instructions, i.e. say the word "Reinforcement" and present himself with an imaginal scene.

Procedures

All subjects filled in the Reinforcement Survey Schedule (RSS) (Cautela & Kastenbaum, 1967) prior to the study. The COR and the Non-contigent groups selected the highest-valence scene from the RSS while the Neutral group selected a neutral scene. All subjects in these groups practiced imagining the particular scene and then were trained to pair it with the word "Reinforcement." The remaining subjects discussed the results of the RSS with an experimenter. Each subject participated in the above task individually.

RESULTS

The following is a preliminary report of the data analysis. A Multivariate Analysis of Variance with planned comparisons for the treatment variable was used to analyze the mean over- or under-estimations for each circle size in Set 2 (see Table 1). No treatment-estimation interaction existed ($p > .05$). Those subjects reinforced for underestimating were significantly better ($p < .0001$) at the task than those reinforced for overestimating circle size. The noted tendancy was for the subjects to overestimate the circle size in the first set of criterion estimations and then to make closer approximations to the true circle size in set 2; thus, when the estimation of one circle

Table 1: Multivariate ANOVA results.

SOURCE	df	F	p
Treatment			
COR vs Word	6, 25	.7197	.64
Neutral vs No feedback	6, 25	3.3689	.01*
Word vs No feedback	6, 25	3.4330	.01*
COR + Neutral vs Non-cont.	6, 25	2.3958	.05*
Estimation	6, 25	4.9480	.0001*
Interaction	24, 88.42	1.2187	.25

*significant differences exist

Table 2: Correlation of percentage of correct responses between training and extinction sets for those groups receiving feedback.

Group		r
1	COR	.825
2	Neutral scene	.913
3	Non-contingent	.170
4	Word Reinforcement	.914

in the training set was compared with the criterion circle it was usually an underestimation.

Of the planned comparisons analyzed only these showed significant differences between groups: 1) the Neutral group estimated the circle sizes in the appropriate direction significantly better than the No Feedback group ($p < .01$); 2) the Word Reinforcement group estimated significantly better than the No Feedback group ($p < .01$); 3) in a complex comparison the two covert reinforcement groups, COR and Neutral scene, estimated the circle sizes in the appropriate direction significantly better than the Non-contingent reinforcement group ($p < .05$).

An estimation of relationship was calculated for the percentages of estimations in the correct direction between the training set, set 2, and the extinction set, set 3. Pearson Product-Moment Correlations were calculated for the four reinforcement conditions (see Table 2). The correlations for the three contingent reinforcement treatments were significantly higher than for the Non-contingent group ($p < .05$).

DISCUSSION

The results of the present study do not corroborate the findings of Wish, Cautela and Steffen (1970), nor do they add support to the validity of the assumptions underlying covert reinforcement. In this study, covert reinforcement was no more effective in modifying overt responses than was no feedback at all. Yet, the use of contingent imaginal neutral scenes did prove superior to no feedback. A conclusion that neutral scenes can serve as reinforcers, however, is unwarranted in light of the fact that they were no better as reinforcers than the word "reinforcement." Recall that the word "reinforcement" was used in three of the groups as an experimenter managed contingency to cue imaginal scenes. The obvious conclusion is that neutral scenes contribute little if any additional reinforcing properties to the word "reinforcement".

What is puzzling is that COR appears to actually have lessened the effect of the word "reinforcement." Further evidence of this is that COR was superior to the non-contingent COR only when combined with the neutral scene group. It may be that several subjects in the CO condition developed a certain response set which precluded reinforcement of a response.

Despite these initially discouraging conclusions a cursory examination of the raw data showed trends which would partially support Wish, Cautela, and Steffens's results. However, the power of the design and analysis was not sufficient to define the trends as statistically significant. Additional analysis is in process to further define what these data contain.

The high correlations of correct estimation responses between the self-managed contingency of the extinction phase and the experimenter-managed contingency of the training phase in the present study are consistent with Kanfer and Duerfeldt's (1967) findings involving the self-reinforcement of an ambiguous learning task. The fact that the non-contingent group had a very low correlation, while contingent groups had high correlations between the testing and extinction phases, helps substantiate the utility of self-management in maintaining behavior change.

In attempting to explain the discrepancies in the results of these two studies, differences in the task stimuli and in the procedures should be noted. The diameters of the circles used in the present experiment ranged in size from one to three inches, while in the Wish, Cautela and Steffen study the range was four to nine inches. It may be that in the present study the subjects had more difficulty in discriminating size differences from slide to slide, thus contributing to less variability in responses and, in some cases, reducing the probability of feedback and reinforcement. The differences in diameter size between the two studies, however, could effect only the total

number of correct responses within each condition, not correct response rates between conditions. The variance in task stimuli should not have differentially affected between group differences within the two studies.

A possible procedural difference between the studies involving the amount of training in imagination seems a more plausible candidate for explaining discrepancies in the obtained results. Wish, Cautela, and Steffen do not report the number of imagination training trials prior to the experimental phase of their study, but it is conceivable that they used a greater number of trials than the three used in the present study. In fact, a published report of an experimental test for covert negative reinforcement exists (Ascher & Cautela, 1972), in which 30 imagination training trials were used. Since the Ascher and Cautela study is identical in terms of the design, task, procedures and statistical analysis to the Wish, Cautela and Steffen study, it seems plausible that the number of imagination trials was also identical. If that is the case, then subjects in the Wish, Cautela and Steffen experiment were given 27 more training trials than those in the present experiment. If the clarity of an image is related to its reinforcing potency, and, if rehearsal is related to the clarity of the image, then more training in imagination should provide more effective reinforcing scenes than those provided by less training. Research is needed to explore this possiblity

SUMMARY

A laboratory study (Wish, Cautela, & Steffen, 1970) directed at validating the underlying assumptions of covert reinforcement was partially replicated. The results of the present study are at variance with those reported by Wish, Cautela and Steffen and do not support the assumptions upon which COR is based nor lend evidence to the efficacy of covert reinforcement. Trends in the raw data, however, appear to corroborate the direction of the

Wish, Cautela, and Steffen results and are being further explored.

Differences in the results of these two studies are discussed and procedural dissimilarities are offered as an explanation for these differences.

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